

Heavy-Duty Diesel Engine Software Upgrade (Chip Reflash) Update

December 9, 2004
Sacramento, California



California Environmental Protection Agency

Air Resources Board

Overview

- Background
- Heavy-Duty Diesel Engine Software Upgrade Regulation
- Voluntary Software Upgrade Program
- Summary and Recommendation

Background

Software Programs on Computer-Controlled Engines

- Computer-controlled engines introduced in the early 1990s
- Manufacturers used software programming that allowed engines to pass certification tests BUT...
- Caused high NO_x emission levels (off-cycle NO_x) during some types of real-world driving: 2 - 3 times certification levels

Consent Decrees/Settlement Agreements

Mfrs: Caterpillar, Cummins, DDC, Volvo,
Mack/Renault, International (Navistar)

Govt: Dept. of Justice, U.S. EPA, ARB

- Agreements announced October 1998
- Engine manufacturers developed low NOx software upgrades
 - Reprogram engines at time of rebuild
 - . . . or upon request

Reflash on Rebuild Too Slow

- Rebuild expected at 300,000 to 350,000 miles
- Engines lasting much longer before rebuild: 750,000 to 1 million miles
- Low NOx software installed on only 13% of eligible engines as of March 31, 2004

Heavy-Duty Diesel Engine Software Upgrade Regulation

Applicability

- 1993 - 1999 model year heavy-duty diesel trucks, school buses, and motor homes
- Includes out-of-state vehicles that visit California
- Excluded:
 - Engines not electronically controlled
 - Software not developed

Implementation Schedule - Approved Regulation

- 1993 - 1994 MY By 4/30/05
- 1995 - 1996 MY By 8/31/05
- 1997 - 1998 MY By 12/31/05
- 1997 - 1998 MY Medium Heavy-Duty by 12/31/06

Board Action in March 2004

- Board adopted regulation
- Board approved Voluntary Program
- Board directed staff to:
 - Withhold filing of regulation, pending Report to Board on December 9th
- Asked staff to review early results

Voluntary Software Upgrade Program

Voluntary Program Reflash Targets

- 35 percent by October 28, 2004
- 60 percent by May 31, 2005
- 80 percent by January 31, 2006
- 100 percent by 2008

Targets based on emission reductions from
reflashable California-registered vehicles

ARB Outreach

- Outreach letter -- over 60,000 sent
- Over 200 calls to dealers -- contacted every authorized dealer
- Distributed brochures
- Booth at Truck Show in Anaheim

Engine Manufacturer Outreach

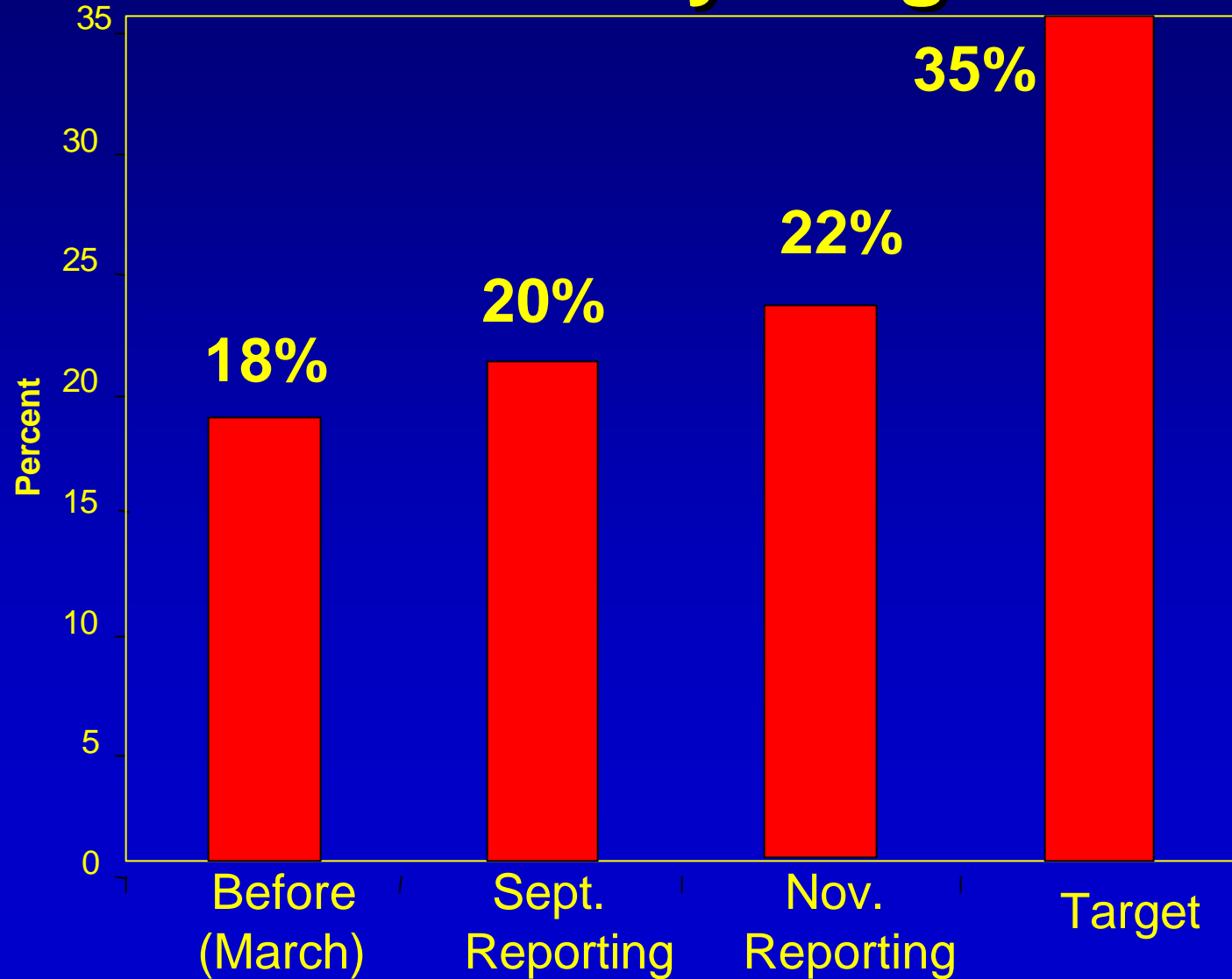
- Letters to authorized dealers/distributors informing them of Voluntary Program
- Follow up calls to authorized dealers/distributors
- Case-by-case reimbursement for electronic control module failures

CTA Outreach

- Dealer Meetings
- Barbecues
- Truck Show
- Fleet Contacts



Progress Toward First Emission Reduction Target of Voluntary Program



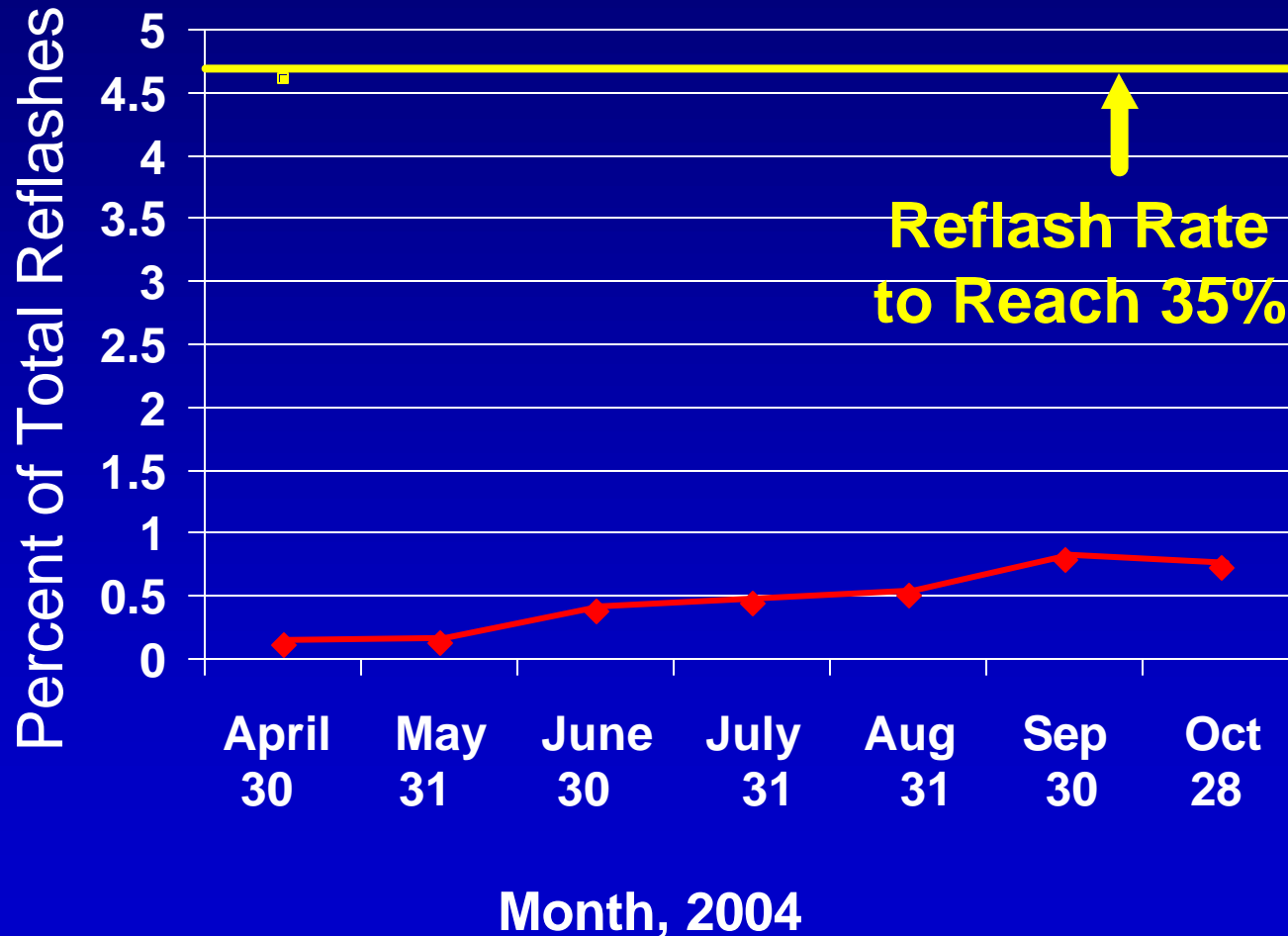
Progress Toward First Emission Reduction Target (35%) by Manufacturer

Manufacturer	Before Voluntary Program	CA-Vehicle Reflashes
DDC	24%	30%
Caterpillar	15%	19%
Cummins	10%	12%
International	2%	9%
Mack/Renault	3%	6%
Volvo	1%	1%

Sustainability Evaluation

- Analysis to determine if second target would be met
- Second Target of 60% by May 30, 2005
- Looked at best monthly reflash rate

Percent of Total Reflashes Performed and Needed to Reach 35%



Sustainability Evaluation

Average Case, Best Case

Monthly Reflash Rate	Percent Reflashed November	Projected Reflashes May 2005	Target May 2005
Average 0.5%	22%	26%	60%
Best Monthly Rate 0.8%	22%	28%	60%

Summary and Recommendation

- Voluntary Program evaluation:
 - No engine manufacturer met 35% target for emission reductions achieved
 - Voluntary Program does not appear sustainable
- Staff recommends:
 - Board direct staff to file the regulation with OAL
 - Begin regulation implementation upon approval by OAL